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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

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Applicant's or agent's file reference P014693WO FOR FURTH			FOR FURTHER A	CTION See Notifica Preliminary	tion of Transmittal of International Examination Report (Form PCT/IPEA/416)	
	International application No. International filing date PCT/GB 03/04199 30.09.2003			International filing date 30.09.2003	(day/month/year)	Priority date (day/month/year) 13.11.2002
	International Patent Classification (IPC) or both national classification and IPC H02H7/085					
	licant DX LI	MITE	D et al.			
1.	This Auth	inter nority	national preliminary exa and is transmitted to the	mination report has be applicant according to	en prepared by this In Article 36.	ternational Preliminary Examining
2.	This	REP	ORT consists of a total of	of 6 sheets, including t	his cover sheet.	
		pee	report is also accompan n amended and are the Rule 70.16 and Section	basis for this report an	d <i>l</i> or sheets containing	tion, claims and/or drawings which have rectifications made before this Authority r the PCT).
	The		nexes consist of a total of			
3.	This	repoi	t contains Indications re	lating to the following i	tems:	
	1	\boxtimes	Basis of the opinion			
	11		Priority			
	Ш		Non-establishment of	opinion with regard to r	ovelty, inventive step	and industrial applicability
	IV		Lack of unity of inventi			
	٧	×	Reasoned statement u	ınder Rule 66.2(a)(ii) w ons supporting such st	ith regard to novelty, i atement	nventive step or industrial applicability;
	VI		Certain documents cite	ed		
	VII		Certain defects in the i	nternational applicatior	1	
	VIII		Certain observations o	n the international app	lication	
Date of submission of the demand Date of completion of this report			this report			
21.05.2004		12.10.2004				
Name	Name and mailing address of the international preliminary examining authority:			al	Authorized Officer	. Date
	<u></u>	Eur D-8 Tel.	ing authority: opean Patent Office 0298 Munich +49 89 2399 - 0 Tx: 52365 : +49 89 2399 - 4465	56 epmu d	Wilhelm, G Telephone No. +49 89	2399-2749

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I.	Basis	of the	report
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1-12

1.	With regard to the elements of the international application (Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)):				
	Description, Pages				
	1-11	as originally filed			
	Claims, Numbers				

as originally filed

Drawings, Sheets

1/5-5/5

as originally filed

sheets:

2.	. With regard to the language , all the elements marked above were available or furnished to this Authority in language in which the international application was filed, unless otherwise indicated under this item.			
	The	ese elements were av	vailable or furnished to this Authority in the following language: , which is:	
		the language of a tr	anslation furnished for the purposes of the international search (under Rule 23.	1(b)).
		the language of pub	plication of the international application (under Rule 48.3(b)).	
		the language of a translation the Rule 55.2 and/or 55	anslation furnished for the purposes of international preliminary examination (u :3).	nder
With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:				the
☐ contained in the international application in written form.				
		filed together with th	ne international application in computer readable form.	
		furnished subseque	ntly to this Authority in written form.	
		furnished subseque	ntly to this Authority in computer readable form.	
		The statement that t in the international a	the subsequently furnished written sequence listing does not go beyond the disa application as filed has been furnished.	closure
		The statement that the listing has been furn	the information recorded in computer readable form is identical to the written se nished.	quence
4. The amendments have resulted in the cancellation of:				
		the description,	pages:	
		the claims,	Nos.:	

 \Box the drawings,

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5. 🗆	This report has been established as if (some of) the amendments had not been made, since they have
	been considered to go beyond the disclosure as filed (Rule 70.2(c)).

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

- 6. Additional observations, if necessary:
- V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- 1. Statement

Novelty (N)

Yes: Claims

No:

1-12

Inventive step (IS)

Yes: Claims

Claims

1-12

No: Claims

Industrial applicability (IA)

Yes: Claims

1-12

No: Claims

2. Citations and explanations

see separate sheet

INTERNATIONAL PRELIMINARY International application No. PCT/GB 03/04199 EXAMINATION REPORT - SEPARATE SHEET

1. Reference is made to the following documents of the search report:

D1: GB-A-2 065 394 (NAT RES DEVICE) 24 June 1981 (1981-06-24)

D2: US-A-4 187 523 (GRAY GEORGE W) 5 February 1980 (1980-02-05)

2. Document D1 discloses an apparatus for sensing short circuit faults.

2.1 It is stated in D1 that it is difficult to provide adequate protection of a three phase supply against short circuits between the phase lines or to a neutral point while permitting direct-on-line starting of three phase squirrel cage induction motors connected to the three phase supply.

This problem is due to the fact that the value of the starting current drawn in each line by such a motor during direct-on-line starting has several time the amplitude of the current drawn when the motor is running under full load conditions and consequently no protection based merely upon sensing of the amplitude of the currents drawn is practicable for short circuit faults which are drawing currents which are of less amplitude than that of the motor starting current (col.1, ls.12-39).

The same problem can be derived from the application (cf. page 1).

- 2.2 Fig. 2 of **D1** shows a graph of the amplitude i_R of the red line current against phase difference between the red line current and the red to yellow line voltage V_R . As stated in more detail on page 1, lines 53-90, the apparatus for sensing short circuit faults in alternating current supply lines includes
 - means for sensing line current in a supply line and producing signals representative of the sensed amplitude and the phase of the sensed line current,
 - means for sensing the line to line or line to neutral voltage of the supply line and producing a signal representative of a phase of the line to line or line to neutral voltage,
 - difference means coupled to receive the signals which are representative of the phases of said current and voltage to produce a measure which varies directly with difference between the said phases, and
 - means for
 - comparing a relationship of the signal representative of **sensed** current amplitude and the said signal produced by the difference means **with** a **predetermined** relationship of amplitude and phase difference (straight line between points S and F in Fig. 2) and
 - producing in response thereto an output signal representative of whether or

EXAMINATION REPORT - SEPARATE SHEET

not the sensed current amplitude is larger than the corresponding amplitude as determined by the said predetermined relationship for the said difference between the said phases

for opening (by means for interrupting), when a fault condition is detected, a circuit breaker having contacts in the supply lines to the motor. (cf. p.4, lines 116-118).

Any condition which results in the phase current amplitude and the phase difference defining a point between the amplitude axis (ordinate) and the linear portion of Fig. 2 is a fault condition and can be detected by comparing the line current amplitude and phase difference values at the point in question with those defined by a predetermined relationship (cf. page 4, lines 35-46). The point S corresponds to the conditions of red line current amplitude and red phase difference at stall or starting or the motor. As the rotor of the motor accelerates, the operating conditions move down the curve 12 from the point S to point F corresponding to operation under full mechanical loading, the motor then working at maximum efficiency. Regarding the problem stated above, the

remainder of the curve between point F to N is of no relevance, it concerns the area of "normal operation" of the motor; in Fig. 5 this portion has been omitted.

- 2.3 Fig. 2 and page 5, lines 8-26, of the application only refer to the linear portion of the prior art graph of current versus the phase lag between the current and voltage measured under non-fault conditions. For each value of current amplitude in a line there is a unique value of phase lag. If a fault occurs the current amplitude increases and the phase lag reduces (an almost identical explanation is comprised in D2, page 3, lines 66-77). Thus, a coordinate defined by a measured value of phase lag (abscissa value) and a measured value of current amplitude (ordinate value) that lies to the left of the selected curve indicates a fault condition.
- 2.4 D1 is thus regarded as being the closest prior art to the subject-matter of independent claim 1, and discloses (the references in parentheses applying to this document):

An apparatus for producing a trip signal to activate a circuit breaker in an alternating current power line, said apparatus comprising:

a sensing circuit (phase discriminator 14) operable to sense values (V, I, Φ_{V}) representing:

a phase difference (Φ_{v}) between current and voltage in said power line; and a current amplitude (I) in said power line;

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a comparison circuit (16, means for comparing) operable to compare said sensed values of phase difference and current amplitude with a trip characteristic defining fault conditions and non-fault conditions (straight line between points S and F) and to generate a fault indication signal when a fault condition arises; a fault discriminator (16, means for producing) operable in response to said fault indication signal to generate a fault identifying signal, and a trip signal generator (relay unit 18, means for interrupting) responsive to said fault identifying signal and operable to generate said trip signal.

2.5 The subject-matter of claim 1 therefore **differs** from this known device in that the fault discriminator discriminates between a first class of fault in which a mean current value after said fault indication increases relative to a mean current value before said fault indication; and a second class of fault in which a mean current value after said fault indication does not increase relative to a mean current value before said fault indication.

This comment also applies to independent claim 12, page 14, lines 5-10.

- 2.6 The distinguishing features are neither disclosed nor rendered obvious by one of the documents D1 or D2 found during search.
- 3. Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in documents D1 is not mentioned in the description, nor is this document identified therein.

The description is not in conformity with the claims as required by Rule 5.1(a)(iii) PCT.

Independent claim 1 is not in the two-part form in accordance with Rule 6.3(b) PCT, which in the present case would have been appropriate, with those features known in combination from the prior art (document D1) being placed in the preamble (Rule 6.3(b)(i) PCT) and with the remaining features being included in the characterising part (Rule 6.3(b)(ii) PCT).